

Spinal versus General Anaesthesia for Laparoscopic Gynaecological Procedures: A Comparative Study of Haemodynamic Changes and Side Effects

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Abstract

Introduction: Laparoscopic gynaecological procedures are conventionally done under general anaesthesia. Spinal anaesthesia is usually preferred only in patients where general anaesthesia is contraindicated. For laparoscopic gynaecological procedures sub arachnoid block is gaining popularity day by day as it is a good alternative to GA.

Objective: To compare haemodynamic changes and side effects between subarachnoid block (SAB) and general anaesthesia (GA) for lower abdominal laparoscopic gynaecological procedures.

Materials and Methods: A total number of sixty female patients were considered and divided equally into two groups as per American Society of Anesthesiologists (ASA) grade I and II. All patients underwent short duration (<1hr) laparoscopic gynaecological procedures. Group-I patients received lumbar SAB and group-II patients received standard general anaesthesia using Propofol, Halothane and Fentanyl. Peri-operative heart rate, blood pressure, Electro-cardiogram (ECG) and Saturation of Oxygen (SPO₂) were monitored. Any intra operative and post operative side effects were also recorded and managed.

Results: Intra operative and post operative heart rate, systolic and diastolic blood pressure were significantly higher (P<0.05) in group-II. Pre-operative, per operative and post operative mean blood pressure (MBP) were also significantly higher (P<0.05) in group-II. During intraoperative period, the side effects in group-I were mainly discomfort and shoulder tip/neck pain and in group-II were hypertension and arrhythmia. Postoperative side effects were mainly postoperative nausea and vomiting (PONV).

Conclusion: Spinal anaesthesia using mixture of bupivacaine and fentanyl can be used as a safe alternative to GA for short duration gynaecological laparoscopic procedures with minimum haemodynamic alterations and reduced post operative side effects. To alleviate shoulder tip/neck pain or discomfort patient needs supplementary sedation and analgesia.

Key-words: Laparoscopic gynaecological procedure, Sub-arachnoid block, General anaesthesia, Hemodynamic parameters, Side effects.

Introduction

Laparoscopic surgery is a revolution in modern surgical technique. In recent years, laparoscopic surgery has become common clinical practice¹. Laparoscopic procedures for gynaecological surgery are commonly applied under General anaesthesia (GA)^{2,19,15}. Regional anaesthesia is preferred only for patients who are at high risk under GA. GA with muscle relaxation and controlled ventilation is the preferred anaesthetic technique because it allows control of airways and ventilation, promotes uniform muscular relaxation and prevents aspiration¹⁷. Another reason for this popularity is that patients who are awake during such procedure do not tolerate the adverse effects of the pneumoperitoneum well³⁻⁶. Carbon dioxide (CO₂) is used as insufflating gas to create pneumoperitoneum. However, some centers have been using Sub Arachnoid Block (SAB) as their first preference in laparoscopic surgery for a long time^{7,8}. The advantages of a conscious patient and relatively uneventful recovery in one hand and the protection from potential complications of GA on the other hand were the main reason for selecting SAB as first choice^{2,9}. Regional anaesthesia in laparoscopic surgery offers some other advantages like

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decreased nausea/vomiting and less postoperative pain. The potential disadvantages are shoulder pain secondary to diaphragmatic irritation; discomfort and anxiety due to abdominal distension are incompletely alleviated using regional anaesthesia^{8-10,19}. One of the most important problems with laparoscopic surgery under SAB is inadequate relaxation of abdominal musculature but this rarely requires conversion to general anaesthesia¹¹.

Laparoscopic surgery using regional anaesthesia often needs supplementation with intravenous sedation and analgesics because of increased anxiety, pain and discomfort. SAB may be a safe and effective technique for short duration gynaecological laparoscopic procedures provided that the patient is not put into extreme Trendelenburg position, the anaesthesia is supported with sedative and analgesics and abdominal pressure is kept between 8-10 mm Hg¹⁸. The length of surgery and surgeons experience is also important factor for the success of the surgeries⁷. In this study attempts have been taken to compare haemodynamic changes under SAB with GA and to assess the feasibility of SAB for lower abdominal laparoscopic gynaecological procedures.

Materials and Methods

This was a prospective comparative study of randomly selected sixty patients of 15-45 years of age, female who underwent short duration (<1hr) laparoscopic gynaecological procedures in Combined Military Hospital Dhaka from September 2012 to February 2013. The patients were divided into two groups by card sampling method with 30 patients in each group of ASA grade I and grade II. An informed written consent was taken from each patient. Group-I received lumbar SAB and Group-II received GA with propofol, halothane and fentanyl. After pre-operative fasting for 6 hrs, with all aseptic precaution group-I patients were administered spinal anaesthesia in the sitting position using 27G Quincke Babcock spinal needles at L₂-L₃ inter space. A combination of 15mg (3ml) 0.5% hyperbaric bupivacaine and 25 microgram (0.5 ml) fentanyl was administered in the lumbar subarachnoid space. As soon as the sensory block reached T₅ dermatome (level of sensory block was tested by pin prick stimulus) the patients were placed in dorsal lithotomy position with 10 degree head down tilt for a period of 10 minutes when the abdomen was prepared for verres needle insertion.

Pneumoperitoneum was created by insufflating CO₂ gas. Intra abdominal pressure was adjusted to have a comfortable working field {mean 8 (±2) cm H₂O}. Patient who complained of neck pain, shoulder tip pain or both and for anxiety and abdominal discomfort inj Midazolam 2 mg and Tramadol 100 mg was administered slowly intravenously (IV). Patient who felt pain even after Midazolam and Tramadol administration, inj Ketamine 25 mg was administered slowly. Bradycardia below 50/min was managed by inj Atropine 0.6 mg. Hypotension at any time during or after surgery was managed by inj Ephedrine 5-10 mg IV intermittently up to a maximum 25 mg. In the post operative period pain was assessed using Visual Analogue Scale (VAS) and treated with inj Diclofenac sodium 50 mg intramuscularly.

In group-II patients standard general anaesthesia was provided. Metoclopramide 10 mg, Ranitidine 50 mg and Fentanyl 1 microgram/kg was administered intravenously (IV) 15 minutes before operation. Induction was done with Propofol, intubation with vecuronium bromide and anaesthesia was maintained with Nitrous oxide (60%), oxygen (40%) & halothane 0.5 Minimum Alveolar Concentration (MAC). Intra operative analgesia was provided by short acting opioid-Fentanyl. Neuromuscular blockade was reversed on completion of surgery with Neostigmine methyl sulphate and Atropine sulphate. Base line heart rate, blood pressure and respiratory rates were noted in all patients. In both groups, continuous ECG, heart rate, blood pressure and SPO₂ were recorded every 5 minutes interval during the procedures. In the post operative period continuous ECG, heart rate, blood pressure and SPO₂ were recorded at 10 minutes interval. Any intra operative and post operative complications were recorded and managed accordingly. All results were expressed as mean ± standard deviation (SD) or in frequencies (percentage) as applicable. All results were compiled and was analyzed using Student's 't' test.

Results

Demographic profiles of the patients in the groups were comparable (Table-I). Intra operative and post operative heart rates were significantly higher (P<0.05) in group-II (Table-II). Intra operative and post operative systolic blood pressure (SBP) were

also significantly higher ($P < 0.05$) in group-II (Table-III). Intra operative and post operative Diastolic blood pressure (DBP) were also significantly higher ($P < 0.05$) in group-II (Table-IV). Pre-operative, per operative and post operative mean blood pressure (MBP) were also significantly higher ($P < 0.05$) in group-II (Table-V).

During intraoperative period, few side effects were observed in both groups (Figure-1). In group-I, these were mainly discomfort and shoulder tip /neck pain and in group-II, hypertension and arrhythmia. The incidences of intra operative complications in SAB group were little higher than GA grouped but the incidences of post operative complication were significantly higher in GA grouped. Complications after the procedures (Table-VI) were mainly post operative nausea and vomiting (PONV) and the incidence of which was significantly higher in group-II. No patient had urinary retention or post dural puncture headache in the post operative period.

Table-I: Patient's demographic characteristics between the study groups (n = 30 patients for each group)

Characteristics	Group-I	Group-II	P
Age(years)	26.20±4.55	26.03±4.58	0.883
Height (cm)	155.97±4.05	155.23±2.84	0.404
Weight (kg)	59.72±6.36	57.80±6.78	0.213
ASA-I	63.33%	70.00%	
ASA-II	36.67%	30.00%	

Values are expressed as mean ± SD. Significant $P < 0.05$ (between two groups) for age, height, body weight, ASA grade-I & II; Student's 't' test was done to find out the difference between groups.

Table-II: Comparison of heart rate at different time between the study groups (n=30 patients in each group)

Period	Group-I (n=30)	Group-II (n=30)	P
Pre operative	79.47±10.52	80.80±7.75	0.617
Per operative	71.00±4.00	77.00±6.00	0.010
Post operative	74.00±4.00	80.00±7.89	0.001

Values are expressed as mean±SD. Significant $P < 0.05$ (between two groups) for heart rate changes in both groups in pre-operative, per operative and post operative period; Student's 't' test was done to find out the difference between groups.

Table-III: Comparison of systolic blood pressure at different time between the study groups (n=30 patients in each group)

Period	Group-I (n=30)	Group-II (n=30)	P
Pre operative	120.93± 12.19	122.1± 8.53	0.673
Per operative	99.00±2.00	111.00±7.00	0.000
Post operative	105.00±7.00	116.00±7.10	0.000

Values are expressed as mean±SD. Significant $P < 0.05$ (between two groups) for systolic blood pressure changes in both groups in pre operative, per operative and post operative period; Student's 't' test was done to find out the difference between groups.

Table-IV: Comparison of diastolic blood pressure at different time between the study groups (n=30 patients in each group)

Period	Group-I (n=30)	Group-II (n=30)	P
Pre operative	67.80± 7.02	69.17± 5.87	0.443
Per operative	53.00±2.00	56.00±1.00	0.000
Post operative	63.00±3.00	67.00±3.22	0.000

Values are expressed as mean±SD. Significant $P < 0.05$ (between two groups) for diastolic blood pressure changes in both groups in preoperative, per operative and post operative period; Student's 't' test was done to find out the difference between groups.

Table-V: Comparison of mean blood pressure at different time between the study groups (n=30 patients in each group)

Period	Group-I (n=30)	Group-II (n=30)	P
Pre operative Op	82.33± 9.39	87.77± 10.41	0.000
Per operative Op	69.00±4.00	75.00±6.01	0.002
Post operative Op	77.15±6.27	83.00±9.22	0.001

Values are expressed as mean±SD. Significant $P < 0.05$ (between two groups) for mean blood pressure changes in both groups in pre operative, per operative and post operative period; Student's 't' test was done to find out the difference between groups.

Table-VI: Side effects after the procedure between the study groups (n=30 patients in each group)

Complications	Group-I (n=30)	Group-II (n=30)	Total Patients
PONV	6 (20%)	15 (50%)	21(35.0%)
Hypotension	3 (10%)	1 (3.33%)	4 (6.67%)
Shivering	1 (3.33%)	1 (3.33%)	2 (3.33%)

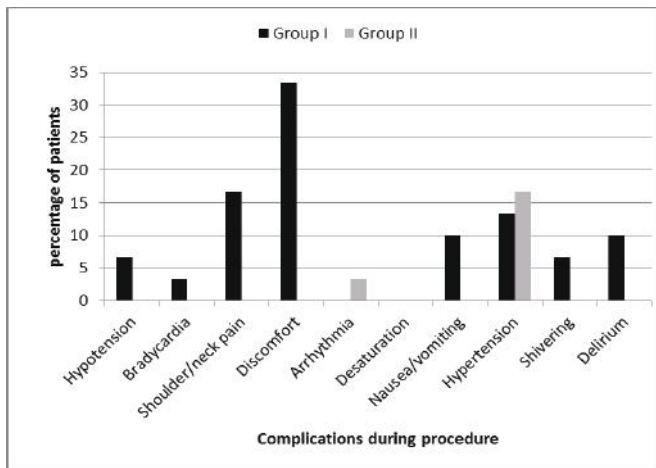


Fig-1: Complications during intra operative period between the groups

Discussion

Laparoscopic gynaecological procedures are conventionally done under general anaesthesia¹⁴. Spinal anaesthesia is usually preferred in patients where general anaesthesia is contraindicated. Spinal anaesthesia is routinely deferred for laparoscopic surgeries because of its suppressive effects on the respiratory muscle function under increased abdominal pressure. Mulroy et al^{3,16} has observed that performing laparoscopic surgery under regional anaesthesia carries many advantages over general anaesthesia like early recovery, reduced PONV, lower post operative pain, shorter hospital stay etc.

This study was to find out haemodynamic alterations under spinal anaesthesia in comparison to GA and to observe the side effects of SAB for laparoscopic gynaecological procedures. In this study, patients of both group showed a significant decrease in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure during intra operative period from the baseline values. These changes are attributed to the sympathetic blockade and decreased afterload after establishing SAB. Yasser et al¹² in their study the feasibility of spinal anaesthesia with sedation for laparoscopic procedure found that changes led ultimately to patient's haemodynamic stabilization secondary to the increase in ejection fraction and cardiac output as confirmed. In addition to SAB related hypotension,

the pneumoperitoneum induced rise in intra abdominal pressure could be another cause for the persistence of hypotension. In the post operative period in both groups heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure increased from intra operative period possibly because of changes in peripheral vascular resistance and relative increase in cardiac index, effects that were maintained thereafter.

In this study, a significant number (50 percent) of patients experienced discomfort of which 5(16.67%) patients experienced shoulder tip/neck pain. A higher incidence of shoulder tip pain has been reported by Minai et al¹³. This was attributed to the physical and chemical stimulation of the diaphragm by pneumoperitoneum. In contrast to this study, Minai et al^{13,17} stated that most of the patients in their study experienced severe agitation often accompanied with chest pain. They related these findings to the lack of efficient sedation or low level of block. No patient had urinary retention or post dural puncture headache in the post operative period. This contradicts with the study of Vaghadia⁴; who observed 38 percent of all patients developed headache in the post operative period.

Conclusion

This prospective study between subarachnoid block and general anaesthesia concludes that spinal anaesthesia using mixtures of Bupivacaine along with Fentanyl can be used as a safe alternative to general anaesthesia for short duration gynaecological laparoscopic procedures with minimum haemodynamic alterations, no respiratory embarrassment even during pneumoperitoneum and reduced post operative complications. But for the experience of shoulder tip /neck pain or discomfort by the patient requires supplementary sedation and analgesia.

References

- Alexander IJ. Pain after laparoscopy. British Journal of Anaesthesia 1997; 79:369-78.
- Kuramochi k, Osuga Y, Yano T. Usefulness of epidural anesthesia in gynecologic laparoscopic surgery for infertility in comparison to general anesthesia. Surg Endosc 2004; 18:847-51.

3. Mulroy MF, Spinal anaesthesia for outpatients: appropriate agents and techniques. *Clin Anesth* 1995; 7:622-7.
5. Pavlin DJ, Rapp SE, Polissar NL. Factors affecting discharge time in adult outpatients . *Anesth Analg* 1998; 87:816-26.
6. Vaghadia H. Spinal anaesthesia for outpatients: controversies and new techniques. *Can J Anesth* 1998; 45:64-70.
7. Murphy AA, Nager CW, Wujek JJ. Operative laparoscopy versus laparotomy for the management of ectopic pregnancy: A Prospective trial. *Fertil Steril* 1992; 57:1180-5.
8. Gerges FJ, Kanazi GE, Jabthhis-Khthisy SI. Anesthesia for laparoscopy: A review. *J Clin Anesthesia* 2006; 18:67-78.
9. Sinha R, Gurwara KA, Gupta CS. Laparoscopic Surgery using Spinal Anesthesia. *JSLs* 2008 Apr-Jun; 12(2):133-8.
10. Pursnani KG, Bazza Y, Calleja M, et al. Laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. *Surg Endosc* 1998; 12:1082-4 [PubMed].
11. Aldrete JA. The post-aneasthesia recovery score revisited. *J Clin Anesth* 1995; 7:89.
12. Ali Y, Elmasry NM, Negmi H, et al. The feasibility of spinal anaesthesia with sedation for laparoscopic general abdominal procedures in moderate risk patients. *MEJ ANESTH* 2008; 19(5):1027-38.
13. Minai H, Yamada K, Tashiro K. Anesthesia management for awake laparoscopic surgery for ectopic pregnancy in a patient with heterotopic pregnancy. *Masui* Nov2005; 54(11):1313-4.
14. Wodlin BN, Nilsson L, Carlsson P, et al. Cost-effectiveness of general anesthesia vs spinal anesthesia in fast-track abdominal benign hysterectomy. *American J of Obs and gynecology* 2011; 205(4):326 e1-326e7.
15. Saraswat N, Kumar a, Mishra A, et al. The comparison of proseal laryngeal mask airway and endotracheal tube in patients undergoing laparoscopic surgeries under general anaesthesia. *Indian Anaesth* 2011; 55:129-34.
16. Daniel M, Elia N, Van KH, et al. Impact of Epidural Analgesia on Mortality and Morbidity after surgery: Systematic Review and Meta-analysis of Randomized Controlled Trails. *Ann Surg* 2014; 259:1056-67.
17. Rawal N. Epidural technique for postoperative pain: gold standard no more? *Reg Anesth Pain Med.* 2012; 37:310-7.
18. Kuramochi K, Osuga Y, Yano t, et al. Usefulness of epidural anesthesia in gynecologic laparoscopic surgery for infertility in comparison to general anesthesia. *Surg Endosc* 2004; 18:847-50.
19. Labato EB, Palge GB, Michelle M, et al. Pneumoperitoneum as a Risk Factor for Endobronchial intubation during laparoscopic Gynecologic Surgery. *Anesthesia and Analgesia* 1998; 86(2):301-3.